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Projected 1982 Carbon Monoxide Levels in the Non-Attainment Areas of New Mexico

Engineering-Science, Inc, Arcadia, CA

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Environmental Protection Agency, Dallas, TX Air and Hazardous Materials Div

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Emission inventories for carbon monoxide in years 1977 and 1982 are provided for nonattainment areas in Farmington, Las Cruces, and Santa Fe. Carbon monoxide emissions for 1977 are provided for the Albuquerque metropolitan area. Carbon monoxide levels for the Farmington, Las Cruces, and Santa Fe nonattainment areas were estimated for 1982 using proportional rollback. Results indicate that air quality standards will be attained by 1982 from application of the Federal Motor Vehicle Control Program.

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1201 Elm Street, Suite 2800
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SECTION 1

SUMMARY

Carbon monoxide levels for the Santa Fe, Farmington and Las Cruces non-attainment areas were estimated for 1982 using proportional roll-back. The results indicate that the federal vehicular control measures will ensure compliance with the National Ambient Air Quality Standards by 1982 in each of the three non-attainment areas.

The carbon monoxide emissions for the Greater Albuquerque Urban Area are presented in the appendix as a reference to show Engineering-Science's contribution to that effort.

SECTION 2

INTRODUCTION

Under EPA Contract No. 68-02-2537, Engineering-Science (ES) assisted the New Mexico Environmental Improvement Agency (NMEIA) and Middle Rio Grande Council of Governments (MRG COG) in the preparation of certain portions of the State Implementation Plan (SIP) revisions. Data to be developed for the plan included inventories of carbon monoxide emissions from mobile sources for specified time periods for designated non-attainment areas of Farmington, Santa Fe and Las Cruces, and for the urban area in and adjacent to Albuquerque, New Mexico. Accordingly, ES has prepared such inventories for 1977 and 1982 for the Farmington, Santa Fe and Las Cruces areas and assisted the MRG COG in preparing the inventory for 1977 for the Albuquerque area.

Additionally, ES conducted "roll-back" calculations for the Farmington, Santa Fe and Las Cruces non-attainment areas in order to estimate whether or not compliance with the applicable national air quality standards will be attained by 1982, and to what degree additional emission reductions, if any, will be needed to attain compliance with the standards by that date.

SECTION 3

GENERAL METHODOLOGY

Calculation of emissions inventories for mobile sources requires the utilization of two basic pieces of information for each source area involved: (1) Average vehicle miles traveled (VMT) per day (or other time period for which the calculation is to be made); and (2) an emission factor, in grams per vehicle mile, for the contaminant of concern. The methodology for obtaining such information and its use in calculating the required emission inventories is described below.

Vehicle Miles Traveled (VMT)

For non-urban areas of New Mexico, VMT for an average day (ADVMT) can be most easily obtained from Vehicle Mileage Logs prepared annually by the New Mexico State Highway Department (NMSHD) which provide average daily traffic counts, and the distance between them, for most non-urban federal, state and local highways. For urban areas, VMT must be estimated by measuring the mileage of the highway sections in the area involved from detailed maps prepared by the NMSHD and using average daily traffic counts available from Traffic Flow Maps for Urban Areas prepared and updated annually by the Highway Department.

Emission Factors and Inventories

Derivation of appropriate emission factors, to be used with the VMT data to calculate mobile source emissions for an area, requires detailed information and/or assumptions regarding the vehicle population of the area. The kind of detail required is defined by the United States Environmental Protection Agency (EPA) in "Mobile Source Emission Factors, Final Document", (EPA-400/9-78-005, March 1978). It must include either information specific for the area's vehicle population, or EPA-provided assumptions regarding: the geographical region (by altitude) in which the area is located; the calendar year for which the calculation is to be made; the average speed of the vehicle population; the average ambient temperature of the area; the average percentage of hot and cold starts for the vehicle population, especially catalyst-equipped cars; and the approximate percentage of VMT attributable to six segments of the vehicle population divided among passenger cars, light duty and heavy duty gasoline-powered vehicles,

heavy duty diesel-powered vehicles and motorcycles. Additionally, such factors as air conditioning usage, vehicle load, trailer towing, humidity and engine size should be taken into account, if possible.

In order to simplify use of the procedures described in its emission factors publication, EPA has also provided a computer program (MOBILE 1) in which EPA assumptions for each of the pertinent factors has already been included but for which substitutions can readily be made if area-specific information is available. This program had already been acquired and tested by ES and it was used, with pertinent data, to synthesize the necessary emission factors. Each was then multiplied by the appropriate VMT to provide the emission inventory for the subject areas.

"Roll-back" Calculations

"Roll-back", or proportional modelling calculations to determine whether or not compliance with applicable ambient air quality standards will be attained by a given year require, initially, the use of available ambient air monitoring data for the area and contaminant of concern for the base year, the concentration levels specified by the air quality standards, and the magnitude of background concentration levels of the contaminant. This permits the calculation of the degree of emissions reduction, if any, which would be required to attain compliance with a given air quality standard. Comparison of the base year emission inventory, for the area and contaminant under consideration, with a similar inventory calculated for the year by which attainment is required, indicates whether or not compliance will be attained and permits the calculation of any additional reduction which may be needed to attain compliance, as indicated by the initial calculation using ambient concentrations.

As appropriate, the above-described operations were carried out for each of the designated non-attainment areas.

SECTION 4

METHODOLOGY FOR SPECIFIC AREAS

Greater Albuquerque Urban Area

Engineering-Science's participation in estimating carbon monoxide emissions from mobile sources in the urban area in and adjacent to Albuquerque involved providing the MRG COG with 1977 average daily VMT data, by functional classification, for highways in the Valencia County and Sandoval County portions of the MRG COG's Area Planning Jurisdiction No. 1. These data are summarized in Table 4-1.

The information used to calculate VMT for rural road classifications was obtained directly from NMSHD Vehicle Mileage Logs and Maps. The information used to determine average daily vehicle miles traveled in urban portions of these areas was developed from 1976 estimates to total VMT for the communities of Bernalillo and Corrales in Sandoval County, and Belen, Bosque Farms and Los Lunas in Valencia County published on the 1976 Average Daily Traffic Map for State Planning and Development District 3, prepared by the MRG COG. These 1976 data, the latest available, were used to estimate 1977 VMT for the same communities by multiplying by a factor (1.032) taken from the 1977/1976 relationship between 1977 and 1976 total VMT on local streets within the city limits of Albuquerque, as shown in Table 7 (page 21) of MRG COG Report No. TR-69, "1977 Vehicle Miles of Travel in the Greater Albuquerque Area", June 1978. It is possible that a factor as high as 1.061 should have been used for this adjustment, but this would have increased the total VMT for the Sandoval/Valencia County areas by less than 0.5 percent. Thus, the more conservative assumption of 3.2 percent increase seems satisfactory. Mileage data for these areas, where shown, were obtained from the Highway Department Logs and Maps.

Farmington

Mobile source emissions of carbon monoxide for the combined non-attainment areas of Farmington were calculated for 1977 and 1982 using VMT data (Table 4-2) developed from NMSHD maps and emission factors computed using Mobile 1 to combine available altitude and temperature data with assumptions

TABLE 4-1

AVERAGE DAILY VEHICLE MILES OF TRAVEL DURING 1977 IN
SANDOVAL AND VALENCIA COUNTY PORTIONS OF THE MIDDLE RIO GRANDE
COUNCIL OF GOVERNMENTS AREA PLANNING JURISDICTION No. 1

Road Classification or Urban Area	Sandoval County Miles	Sandoval County ADVMT	Valencia County Miles	Valencia County ADVMT	Total Miles	Total ADVMT
RURAL VMT (a)						
Interstate	8.8	142,112	23.3	107,536	32.1	249,648
Federal Aid Primary	1.6	8,508	33.2	100,384	34.8	108,892
Federal Aid Secondary	32.7	65,026	27.4	103,714	60.1	168,740
State Roads	1.5	570	44.6	15,341	46.1	15,911
Rural Subtotal	44.6	216,216	128.5	326,975	173.1	543,191
URBAN VMT						
Interstate (b)	0.0	-0-	0.0	-0-	0.0	-0-
Federal Aid Primary (b)	0.0	-0-	3.5	(b)	3.5	(b)
Federal Aid Secondary (b)	1.5	(b)	3.8	(b)	5.3	(b)
State Roads (b)	3.9	(b)	1.2	(b)	5.1	(b)
Bernalillo (c)	(c)	16,183	-	-	(c)	16,183
Corrales (c)	(c)	14,575	-	-	(c)	14,575
Belen (c)	-	-	(c)	51,509	(c)	51,509
Bosque Farms (c)	-	-	(c)	30,168	(c)	30,168
Los Lunas (c)	-	-	(c)	17,239	(c)	17,239
Urban Subtotal	>5.4	30,758	>8.5	98,916	>13.9	129,674
Rural and Urban Total	>50.0	246,974	>137.5	425,891	>187.0	672,865

(a) Compiled from 1977 New Mexico State Highway Department Vehicle Mileage Logs and Maps

(b) Mileage data from 1977 State Highway Department Vehicle Mileage Logs, however, no urban traffic count data are provided and ADVMT cannot be calculated. It is assumed that these mileage data are included in the totals for the individual urban areas.

(c) Estimated from 1976 ADVMT data on 1976 Average Daily Traffic Map for State Planning and Development District 3 (MRG COG) using a 1977/1976 adjustment factor indicating a 3.2% increase in traffic on local streets within the city limits of Albuquerque (Table 7, pg 21 "1977 Vehicle Miles of Travel in the Greater Albuquerque Area" Report No. TR-69, June 1978, Middle Rio Grande Council of Governments of New Mexico

TABLE 4-2

SUMMARY OF AVERAGE DAILY VEHICLE MILES TRAVELED [(a)] DURING 1977
IN DESIGNATED NON-ATTAINMENT AREAS (FOR CO) IN FARMINGTON

Description of Area	Available Traffic Volume Information	Miles	Average Daily Traffic	Average Daily VMT
a) One block north of Main Street, from its intersection with Broadway to one block east of Butler Avenue	On Main Street, itself	1.50	20,373	30,560
	On Auburn Street and Butler Avenue (Vine Ave.) for one block	0.16	11,963	1,914
		1.66	19,563	32,474
a + b) Area between Main Street and Broadway	On Auburn St., Behrends Ave., Miller Ave., Butler Ave., between Main St. and Broadway and on San Juan Blvd. for one block east of S. Butler Ave.	0.45	8,449	3,802
b) One block south of Broadway, from its intersection with Main Street to one block east of Butler Avenue	On Broadway, itself on Lake St., Behrends Ave., and S. Butler Ave. for one block	1.50	16,810	25,215
		0.21	4,776	1,003
		1.71	15,332	26,218
TOTAL	Non-attainment areas a) and b) and the area between them	3.82	16,360	62,494

(a) Compiled from mileage and traffic count data obtained from New Mexico State Highway Department maps

regarding the average speed and daily vehicle population mix for the portions of Main Street, Broadway and connecting streets within the designated areas. The data provided to the computer, and their bases, are summarized in Table 4-3.

Factors were developed for the summer and winter seasons and the annual average, and factors for the seasonal distribution of daily average VMT were developed from Figure 2 of the 1972 "Farmington/Aztec/Bloomfield Traffic Study" prepared by the Highway Department. It was found that traffic during the May-October period averaged 5 percent above annual average daily traffic and during the November-April period averaged 6 percent below the annual average. VMT data used for the three time periods were: Summer, 65,619; Winter, 59,369; and Annual, 62,494.

Santa Fe

Mobile source emissions of carbon monoxide for the single designated non-attainment area of Santa Fe, Cerrillos Road from St. Michael's Drive to Sandoval Street, were calculated for 1977 and 1982 using the same methodology described for Farmington. The VMT data are provided in Table 4-4 and the data provided to the computer for use with the Mobile 1 program are summarized in Table 4-5.

Again, factors were derived for the summer and winter seasons and for the annual average, and factors for the seasonal distribution of daily average VMT were developed from Figure 2 of the 1976 "Santa Fe Traffic Study" report prepared by the NMSHD. It was found that daily traffic during the May-October period averaged 8.5 percent higher than the annual average and that during the November-April period it averaged 9 percent below the annual average. Daily VMT estimates used for the three time periods were: Summer, 74,930; Winter, 62,845; and Annual, 69,060.

Annual average daily VMT for areas within Santa Fe designated as Unclassifiable were also estimated, but associated carbon monoxide emissions were not calculated. These VMT data are presented in Table 4-6.

Las Cruces

Mobile source emissions of carbon monoxide for the three designated non-attainment areas in Las Cruces were calculated, individually, using

TABLE 4-3

MOBILE 1 (a) EMISSION FACTOR ASSUMPTIONS

FOR FARMINGTON NON-ATTAINMENT AREAS

MAIN STREET AND BROADWAY

Scenario Number	1	2	3	4	5	6
Data for Card #1 (Req'd for scen.)						
R - Region	3 - High Altitude		3 - High Altitude		3 - High Altitude	
Yr - Last Two digits, calendar year	77	82	77	82	77	82
Speed - Avg. (Bag specific not available) (b)	25.0:25.0/25.0/25.0 mph		25.0:25.0/25.0/25.0 mph		25.0:25.0/25.0/25.0 mph	
Ambient Temp. °F (Season) (c)	67°F(Summer)		39°F(Winter)		53°F(Ann. Avg.)	
% Cold/% Hot/% Cold Start (d)	20.6/27.3/20.6		20.6/27.3/20.6		20.6/27.3/20.6	
Data for Card #2 - Vehicle Mileage Mix (e)						
LDV - % Light Duty Vehicles (Passenger cars <6,000)	52.0	50.0	52.0	50.0	52.0	50.0
LDT 1 - % Light Duty Trucks (<6,000 lbs)	20.0	21.0	20.0	21.0	20.0	21.0
LDT 2 - % Light Duty Trucks (6,000 to 8,500 lbs)	20.0	21.0	20.0	21.0	20.0	21.0
HDG - % Heavy Duty Gasoline vehicles (>8,500 lbs)	2.5	2.5	2.5	2.5	2.5	2.5
HDD - % Heavy Duty Diesel vehicles (>8,500 lbs)	3.0	3.0	3.0	3.0	3.0	3.0
MC - % Motorcycles	0.5	0.5	0.5	0.5	0.5	0.5
For Cards #3 and 4, EPA assumptions, already programmed, were used.						

(a) EPA Computer program for derivation of mobile source emission factors

(b) Average speed obtained from the Farmington Police Department

(c) From U.S. Weather Bureau data and AAA tour Book 1978 Edition. Each temp. represents the average of the monthly maxima and minima for the period. Summer = May-October; Winter = November-April, Annual Average = Calendar Year

(d) EPA assumptions used since area specific data are not available

(e) Derived from New Mexico State Highway Department traffic count data on U.S. 550 at Jct. NM 17 W. of Farmington and at 5.2 miles W. of Aztec; on U.S. 64, 2.5 miles E. of Farmington; and N.M. 170 at Jct. 550 (1977 New Mexico Traffic Survey, Table 5, pp. 78,82,86. NMSHD)

TABLE 4-4

SUMMARY OF AVERAGE DAILY VEHICLE MILES TRAVELED [a] DURING 1977

IN DESIGNATED NON-ATTAINMENT AREA (FOR CO) IN SANTA FE

Description of Area	Available Traffic Volume Information	Miles	Average Daily Traffic	Average Daily VMT
One block on either side of Cerrillos Road, From St. Michael's Drive to Sandoval Street	On Cerrillos Road, itself:			
	From St. Michael's Drive to Cordova Road;	1.51	30,196	45,595
	From Cordova Road to St. Francis Drive;	0.24	25,438	6,105
	From St. Francis Drive to Hickox Street;	0.58	26,805	15,547
	From Hickox Street to East Manhattan Street (Junction with Sandoval Street)	0.09	20,141	1,813
TOTAL	Cerrillos Road from St. Michael's Drive to Sandoval Street	2.42	28,537	69,060

(a) Compiled from mileage and traffic count data obtained from New Mexico State Highway Department maps

TABLE 4-5

MOBILE 1 [a] EMISSION FACTOR ASSUMPTIONS

FOR SANTA FE NON-ATTAINMENT AREA

CERRILLOS ROAD

Scenario Number	1	2	3	4	5	6
Data for Card #1 (Req'd for each scen.)						
R - Region	3 - High Altitude		3 - High Altitude		3- High Altitude	
Yr - Last two digits, calendar year	77	82	77	82	77	82
Speed - Avg. (Bag specific not available) (b)	35.0:35.0/35.0/35.0 mph		35.0:35.0/35.0/35.0 mph		35.0:35.0/35.0/35.0 mph	
Ambient Temp. °F (Season) (c)	61°F (Summer)		37°F (Winter)		49°F (Ann. Avg.)	
% Cold/% Hot/% Cold Start (d)	20.6/27.3/20.6		20.6/27.3/20.6		20.6/27.3/20.6	
Data for Card #2 - Vehicle Mileage Mix (e)						
LDV - % Light Duty Vehicles (Passenger cars <6,000 lbs)	72.0	70.0	72.0	70.0	72.0	70.0
LDT 1 - % Light Duty Trucks (<6,000)	12.0	13.0	12.0	13.0	12.0	13.0
LDT 2 - % Light Duty Trucks (6,000 to 8,500 lbs)	12.0	13.0	12.0	13.0	12.0	13.0
HDG - % Heavy Duty Gasoline vehicles (>8,500 lbs)	1.8	1.8	1.8	1.8	1.8	1.8
HDD - % Heavy Duty Diesel vehicles (>8,500 lbs)	1.9	1.9	1.9	1.9	1.9	1.9
MC - Motorcycles	0.3	0.3	0.3	0.3	0.3	0.3
For Cards #3 and 4, EPA assumptions, already programmed, were used.						

(a) EPA Computer program for derivation of mobile source emission factors
(b) Average speed obtained from the Santa Fe Police Department
(c) From U.S. Weather Bureau data and AAA Tour Book 1978 Edition. Each temp. represents the average of the monthly maxima and minima for the period. Summer = May-October; Winter = November-April; Annual Average = calendar year.
(d) EPA assumptions used since area specific data are not available
(3) Derived from New Mexico State Highway Department traffic count data at Stateion # WIM 1 in the Santa Fe North City Limits 1.5 mi S. of ATR Station Cts. (Truck weight Study - 1977 NMSHD page 27) (Agrees, generally, with other available information)

TABLE 4-6

SUMMARY OF AVERAGE DAILY VEHICLE MILES TRAVELED [a] IN

DESIGNATED UNCLASSIFIABLE AREAS (FOR CO) IN SANTA FE

LOCATION	MILES	AVERAGE DAILY VEHICLE MILES TRAVELED
a) A corridor, one block on either side of Cerrillos Road, from St. Michael's Drive to Richards Avenue	1.62	41,555
b) A corridor, one block on either side of St. Francis Drive, from St. Michael's Drive to Paseo de Peralta (N)	1.52	38,012
c) A corridor, one block on either side of Cordova Road, from Cerrillos Road to Galisteo Street	0.73	7,702
c) That area of Santa Fe bounded by Paseo de Peralta on the north, east and south, and St. Francis Drive on the west, excluding one block on either side of Cerrillos, from Paseo de Peralta to Sandoval, which is classified non-attainment.	9.53	92,525
TOTAL, Unclassifiable Areas a)-d)	13.40	179,794

(a) Compiled from mileage and traffic count data obtained from New Mexico State Highway Department maps

the same procedures described on the preceding page. The streets and highways primarily involved for these areas are: (a) a circle having a radius of 1,000 feet at the intersection of Interstate 10, Main Street, University Avenue and Valley Drive and including portions of each; (b) Picacho Avenue from Solano Drive to Valley Drive (U.S. 85); and (c) Solano Drive from University Avenue to Picacho Avenue. The estimated vehicle mileage data are shown in Table 4-7. The data provided to the computer for use with the Mobile 1 program for each area are summarized in Tables 4-8, 9, 10, and 11.

Again, emission factors were computed for each area for the summer and winter seasons for 1977 and 1982, as well as the annual average for each year, and factors for the seasonal distribution of VMT were developed from data presented in a report prepared by the NMSHD titled "Summary Traffic Flow and External Cordon Survey, 1969", describing results of the Las Cruces Area Transportation Study. These data indicated that average daily traffic in Las Cruces during the May-October period was 5 percent higher than the annual average and during the November-April period, 5 percent lower. Seasonal and average annual VMT for the three areas are shown below.

Non-attainment Area	Average Daily Vehicle Miles Traveled		
	Summer	Winter	Annual
(a) 1,000 ft. radius circle	11,666	10,555	11,110
(b) Picacho Avenue	18,809	17,017	17,913
(c) Solano Drive	44,189	39,981	42,085

Annual average daily VMT for areas within Las Cruces designated as Unclassifiable for carbon monoxide were also determined, but associated carbon monoxide emissions were not calculated. The VMT data for these areas are presented in Table 4-12.

TABLE 4-7

SUMMARY OF AVERAGE DAILY VEHICLE MILES TRAVELED [a] DURING 1977

IN DESIGNATED NON-ATTAINMENT AREAS (FOR CO) IN LAS CRUCES

Description of Area	Available Traffic Volume Information	Miles	Average Daily Traffic	Average Daily VMT
a) An area within a 1,000 ft. radius from the Howard Johnson Motel at University Avenue and Valley Drive.	On I-10, S.E. of area center.	0.19	8,629	1,640
	On I-10, N.W. of area center.	0.19	7,316	1,390
	On Main St.,S. of area center.	0.19	11,238	2,135
	On Main St.,N. of area center.	0.19	9,533	1,811
	On University Ave., E. of area center.	0.19	7,000	1,330
	On University Ave., W. of area center.	0.19	3,144	597
	Portion of Valley Dr. (U.S.85) within designated area.	0.40	5,518	2,207
Total	Portions of streets and highways within area a).	1.54	7,214	11,110
b) A corridor, one block on either side of Picacho Ave., extending from Valley Dr. to Solano Dr.	On Picacho Ave.(U.S. 180/80/70):			
	From Solano Dr. to Main St.;	0.68	5,672	3,857
	From Main St. to Alameda;	0.16	13,173	2,108
	From Alameda to AT & SF railway Crossing;	0.36	15,125	5,445
	From AT & SF Railway Crossing to Valley Dr. (U.S.85).	0.48	13,547	6,503
Total	Picacho Ave. (U.S. 180/80/70) within area b).	1.68	10,663	17,913
c) A corridor, one block on either side of Solano Dr. extending from Picacho Ave. to University Ave.	On Solano Drive:			
	From University Ave. to Boutz Rd.;	0.8	12,782	10,226
	From Boutz Rd. to Lohman Ave.	1.0	16,734	16,734

TABLE 4-7 (CONT'D.)

SUMMARY OF AVERAGE DAILY VEHICLE MILES TRAVELED [a] DURING 1977

IN DESIGNATED NON-ATTAINMENT AREAS (FOR CO) IN LAS CRUCES

Description of Area	Available Traffic Volume Information	Miles	Average Daily Traffic	Average Daily VMT
c) Cont'd.	From Lohman Ave. to Amador Ave.;	0.1	16,791	1,679
	From Amador Ave. to Picacho Ave.	0.8	16,807	13,446

(a) Compiled from mileage and traffic count data obtained from New Mexico State Highway Department maps.

TABLE 4-8

MOBILE 1 [(a)] EMISSION FACTOR ASSUMPTIONS

FOR LAS CRUCES NON-ATTAINMENT AREA a)

INTERSTATE 10 PORTION (27.3 PERCENT OF AREA a) VMT)

Scenario Number	13	14	15	16	17	18
Data for Card #1 (Req'd. for each scen.)						
R - Region	3-High Altitude		3-High Altitude		3-High Altitude	
Yr - Last two digits calendar year	77	82	77	82	77	82
Speed - Avg. (Bag specific not available) (b)	54.1:54.1/54.1/54.1mph		54.1:54.1/54.1/54.1mph		54.1:54.1/54.1/54.1mph	
Ambient Temp.°F (season) (c)	85°F (Summer)		50°F (Winter)		68°F (Ann. Avg.)	
% Cold/% Hot/% Cold Start (d)	20.6/27.3/20.6		20.6/27.3/20.6		20.6/27.3/20.6	
Data for Cart. #2-Vehicle Mileage Mix (e)						
LDV-% light duty vehicles (passenger cars < 6,000 #'s)	55.7	55.0	55.7	55.0	55.7	55.0
LDT 1 - % light duty trucks (< 6,000 #'s)	8.3	8.5	8.3	8.5	8.3	8.5
LDT 2 - % light duty trucks (6,000-8,500 #'s)	8.2	8.5	8.2	8.5	8.2	8.5
HDG - % heavy duty gasoline vehicles (> 8,500 #'s)	6.1	6.3	6.1	6.3	6.1	6.3
HDD - % heavy duty diesel vehicles (> 8,500 #'s)	21.4	21.4	21.4	21.4	21.4	21.4
MC - % motor cycles	0.3	0.3	0.3	0.3	0.3	0.3
For Cards #'s 3 and 4, EPA assumptions, already programed, were used.						

(a) EPA computer program for derivation of mobile source emission factors.

(b) Average speed obtained from MRG COG Report No. TR-71, "1977 Vehicle Emissions in the Greater Albuquerque Area", July 1978. Average Interstate Speed.

(c) From U.S. Weather Bureau data and AAA Tour Book 1978 Edition. Each temperature represents the average of the monthly maxima and minima for the period. Summer = May-Oct.; Winter = Nov.-April; Annual Avg. = Calendar Yr.

(d) EPA assumptions used since area specific data are not available.

(e) Derived from distribution at NMSHD traffic count station on I-10 near Dona Ana/Luna County line (Table 5, pg. 76, 1977 New Mexico Traffic Survey, prepared by NMSHD) modified to exclude 1-axle vehicles and redistribute misc. 2-axle vehicle counts.

TABLE 4-9

MOBILE 1 (a) EMISSION FACTOR ASSUMPTIONS

FOR LAS CRUCES NON-ATTAINMENT AREA a)

SURFACE STREETS PORTION (72.7 PERCENT OF AREA a) VMT)

Scenario Number	19	20	21	22	23	24
Data for Card #1 (Req'd. for each Scen.)						
R - Region	3-High Altitude		3-High Altitude		3-High Altitude	
Yr - Last two digits, calendar year	77	82	77	42	77	82
Speed - Avg. (Bag specific not avail.) (b)	39.0:39.0/39.0/39.0mph		39.0:39.0/39.0/39.0mph		39.0:39.0/39.0/39.0mph	
Ambient Temp. °F (season) (c)	85°F (Summer)		50°F (Winter)		68°F (Ann. Avg.)	
% Cold/% Hot/% Cold Start (d)	20.6/27.3/20.6		20.6/27.3/20.6		20.6/27.3/20.6	
Data for Card #2 - Vehicle Mileage Mix (e)						
LDV-% light duty vehicles (passenger cars < 6,000 #'s)	80.3	78.3	80.3	78.3	80.3	78.3
LDT 1 - % light duty trucks (< 6,000 #'s)	5.8	6,8	5.8	6.8	5.8	6.8
LDT 2 - % light duty trucks (6,000-8,500 #'s)	5.8	6.8	5.8	6.8	5.8	6.8
HDG - % heavy duty gasoline vehicles (> 8,500 #'s)	4.5	4.5	4.5	4.5	4.5	4.5
HDD - % heavy duty diesel vehicles (> 8,500 #'s)	3.1	3.1	3.1	3.1	3.1	3.1
MC - % motor cycles	0.5	0.5	0.5	0.5	0.5	0.5
For Cards #'s 3 and 4, EPA assumptions, already programmed, were used.						

(a) EPA Computer program for derivation of mobile source emission factors.
(b) Weighted average based on posted speed limits for individual streets obtained from the Las Cruces Police Department.
(c) From U.S. Weather Bureau data and AAA Tour Book 1978 Edition. Each temperature represents the average of the monthly maxima and minima for the period. Summer = May-Oct.; Winter = Nov.-April; Annual Average = Calendar Year.
(d) EPA assumptions used since area specific data are not available.
(e) EPA Vehicle Mix #1 from "Mobile Source Emission Factors - Final Document", (EPA-400/9-78-005, March 1978), page F-5.

TABLE 4-10

MOBILE 1 (a) EMISSION FACTOR ASSUMPTIONS

FOR LAS CRUCES NON-ATTAINMENT AREA b)

PICACHO AVENUE

Scenario Number	25	26	27	28	29	30
Data for Card #1 (Req'd. for each scen.)						
R - Region	3-High Altitude		3-High Altitude		3-High Altitude	
Yr - Last two digits, calendar year	77	82	77	82	77	82
Speed - Avg. (Bag specific not avail.) (b)	30.0:30.0/30.0/30.0mph		30.0:30/0/30.0/30.0mph		30.0:30.0/30.0/30.0mph	
Ambient Temp. °F (season) (c)	85°F (Summer)		50°F (Winter)		68°F (Ann. Avg.)	
% Cold/% Hot/% Cold Start (d)	20.6/27.3/20.6		20.6/27.3/20.6		20.6/27.3/20.6	
Data for Card #2 - Vehicle Mileage Mix (e)						
LDV - % light duty vehicles (passenger cars < 6,000 #'s)	63.0	61.0	63.0	61.0	63.0	61.0
LDT 1- % light duty trucks (< 6,000 #'s)	16.0	17.0	16.0	17.0	16.0	17.0
LDT 2- % light duty trucks (6,000-8,500 #'s)	16.0	17.0	16.0	17.0	16.0	17.0
HDG - % heavy duty gasoline vehicles (> 8,500 #'s)	2.4	2.4	2.4	2.4	2.4	2.4
HDD - % heavy duty diesel vehicles (> 8,500 #'s)	0.2	0.2	0.2	0.2	0.2	0.2
For Cards #'s 3 and 4, EPA assumptions, already programmed, were used						

(a) EPA computer program for derivation of mobile source emission factors.
(b) Average speed based on posted speed limits obtained from Las Cruces Police Department
(c) From U.S. Weather Bureau data and AAA Tour Book 1978 Edition. Each temperature represents the average of the monthly maxima and minima for the period. Summer = May-Oct.; Winter = Nov.-April; Annual Average = Calendar Year.
(d) EPA assumptions used since area specific data are not available.
(e) EPA Mix #2 modified slightly to include some motorcycle traffic. 1982 distribution modified slightly to account for the current trend in New Mexico toward greater use of light-duty trucks instead of passenger cars.

TABLE 4-11

MOBILE 1 (a) EMISSION FACTOR ASSUMPTIONS

FOR LAS CRUCES NON-ATTAINMENT AREA c)

SOLANO DRIVE

Scenario Number	31	32	33	34	35	36
Data for Card #1 (Req'd. for each scen.)						
R - Region	3-High Altitude		3-High Altitude		3-High Altitude	
Yr - Last two digits, calendar year	77	82	77	82	77	82
Speed - Avg. (Bag specific not avail.) (b)	35.0:35.0/35.0/35.0mph		35.0:35.0/35.0/35.0mph		35.0:35.0/35.0/35.0mph	
Ambient Temp. °F (season) (c)	85°F (Summer)		50°F (Winter)		68°F (Ann. Avg.)	
% Cold/% Hot/% Cold Start (d)	20.6/27.3/20.6		20.6/27.3/20.6		20.6/27.3/20.6	
Data for Card #2 -•Vehicle Mileage Mix (e)						
LDV - % light duty vehicles (passenger cars < 6,000 #'s)	65.0	63.0	65.0	63.0	65.0	63.0
LDT 1- % light duty trucks (< 6,000 #'s)	16.4	17.4	16.4	17.4	16.4	17.4
LDT 2- % light duty trucks (6,000-8,500 #'s)	16.4	17.4	16.4	17.4	16.4	17.4
HDG - % heavy duty gasoline vehicles (> 8,500 #'s)	1.0	1.0	1.0	1.0	1.0	1.0
HDD - % heavy duty diesel vehicles (> 8,500 #'s)	1.0	1.0	1.0	1.0	1.0	1.0
MC - % motorcycles	0.2	0.2	0.2	0.2	0.2	0.2
For Cards #'s 3 and 4, EPA assumptions, already programmed, were used						

(a) EPA computer program for derivation of mobile source emission factors.
(b) Average speed based on posted speed limits obtained from Las Cruces Police Department.
(c) From U.S. Weather Bureau data and AAA Tour Book 1978 Edition. Each temperature represents the average of the monthly maxima and minima for the period. Summer = May-Oct.; Winter = Nov.-April; Annual Average = Calendar Year.
(d) EPA assumptions used since area specific data are not available.
(e) EPA Mix #2 modified slightly to approximate available local NMSHD data and include some motorcycle traffic. 1982 distribution modified slightly to account for the current trend in New Mexico toward greater use of light-duty trucks instead of passenger cars.

TABLE 4-12

SUMMARY OF AVERAGE DAILY VEHICLE MILES TRAVELED IN DESIGNATED UNCLASSIFIABLE AREAS (FOR CO) IN LAS CRUCES

Location	Miles	Average Daily Vehicle Miles Traveled
a) A corridor, one block on either side of Solano Drive, from Picacho Avenue to Main Street.	1.2	12,338[a]
b) A corridor, one block on either side of Main Street, from Solano Drive to Picacho Avenue.	1.1	12,897[a]
c) A corridor, one block on either side of Alameda, from Picacho Avenue to Main Street.	0.9	11,207[a]
d) A corridor, one block on either side of El Paseo Road, from Main Street to University Avenue.	1.8	30,373[a]
e) A corridor, one block on either side of Main Street, from Amador Avenue to Valley Drive.	1.8	24,087[a]
f) A corridor, one block on either side of Valley Drive, from Picacho Avenue to Main Street.	2.6	26,103[a]
g) A corridor, one block on either side of University Avenue, from Solano Drive to Main Street.	0.7	8,285[a]
Subtotal, Areas a) through g)	10.1	125,290
h) An area encompassing the main portion of the New Mexico State University campus. Because detailed data were not readily available, two estimates of ADVMT for this area are presented, as follows:		
1. a. From the number of parking spaces on campus, the size of the campus and traffic counts on adjacent streets;	7.0	4,672[b]
b. That portion of N.M. 342 adjacent to the campus;	0.7	4,950[b]
c. That portion of University Avenue between Solano Drive and I-25.	0.8	7,671[b]
Total, based on method 1	8.5	17,293

TABLE 4-12 (CONT'D.)

SUMMARY OF AVERAGE DAILY VEHICLE MILES TRAVELED IN DESIGNATED UNCLASSIFIABLE AREAS (FOR CO) IN LAS CRUCES

Location	Miles	Average Daily Vehicle Miles Traveled
h) Cont'd.		
2. From an estimate of VMT for N.M. 101 in the 1977 Highway Department Vehicle Mileage Logs, which may be for streets and roads on the University campus.	9.3	32,690[b]

It is not known which estimate is more nearly correct, but these provide some basis for examining mobile source emissions for the area

(a) Compiled from mileage and traffic count data obtained from NMSHD maps.

(b) Developed from personal communication with personnel of the New Mexico State University Police in Las Cruces, and from NMSHD maps and Vehicle Mileage Logs.

SECTION 5

RESULTS AND DISCUSSION

Greater Albuquerque Urban Area

The mobile source emission inventory calculations for 1977 for the urban area in and adjacent to Albuquerque were carried out by personnel of the MRG COG. The results of these calculations and their bases are presented and described in their report No. TR-71, "1977 Vehicle Emissions in the Greater Albuquerque Area", July 1978. A copy of their results, as summarized in Table 1 of that report, is included in the Appendix for reference. No "roll-back" calculations or other treatment of these data have yet become available.

Farmington

Carbon monoxide emission inventory calculations for the summer and winter seasons and annual average for 1977 and 1982 for the designated non-attainment area in Farmington were carried out using the VMT data and emission factors previously discussed. The results of these calculations are presented in Table 5-1.

TABLE 5-1

CARBON MONOXIDE EMISSIONS FOR FARMINGTON NON-ATTAINMENT AREA

Time Period	1977			1982		
	Avg. Daily VMT	E.F.[a] gm/mi.	Avg. Daily Emissions Lbs./Day	Avg. Daily VMT [b]	E.F.[a] gm/mi.	Avg. Daily Emissions Lbs./Day
Summer (May-October)	65,619	89.68	12,962	80,580	63.40	11,253
Winter (November-April)	59,369	104.25	13,633	72,905	74.13	11,904
Annual Average	62,484	95.99	13,211	76,743	67.87	11,473

a) As calculated using Mobile 1 Scenarios 1-6.

b) Projected from 1977 VMT assuming 4.2 percent (1.220) average annual growth rate [from Smith, J. T., "Analysis of San Juan County Air Quality Maintenance Area (Carbon Monoxide)"]. NMEIA.

"Roll-back" calculations for this area were also carried out using a design value for 1976 obtained from the U.S. EPA, Region 6. This value, 9.4 ppm CO, 8-hour average, which occurred on December 23, 1976, at Site 1Y, was the second highest 8-hour average value measured at Farmington during 1976. The highest 8-hour average concentration during 1976 was 10.4 ppm CO on December 23. Ambient air quality standards against which these values should be compared are presented in Table 5-2.

TABLE 5-2

NATIONAL AMBIENT AIR QUALITY STANDARDS

Averaging Period	National Ambient Air Quality Standards (NAAQS)
1-Hour Average CO Concentration	40 mg/cu.m. (35.0 ppm)
8-Hour Average CO Concentration	10 mg/cu.m. (9.0 ppm)

The highest and second highest 1-hour average concentration of CO reported during 1976 for the Farmington area were 17.0 and 16.0 ppm, respectively.

Assurance that compliance will be attained during 1982 is required, so it becomes necessary to compare carbon monoxide emission levels expected for 1982 with those calculated for 1976. A 13 percent reduction is anticipated. Therefore, the 1982 8-hour carbon monoxide design value is calculated to by 8.3 ppm. This assumes a background carbon monoxide level of 1 ppm.

Santa Fe

Average daily mobile source emissions of carbon monoxide for summer, winter and annual average traffic during 1977 and 1982 in the designated non-attainment area of Santa Fe were calculated using the VMT data and emission factors discussed earlier. The results of these calculations are presented in Table 5-3.

TABLE 5-3

CARBON MONOXIDE EMISSIONS FOR SANTA FE NONATTAINMENT AREA

Time Period	1977			1982		
	Avg. Daily VMT	E.F. gm/mi. [1)]	Avg. Daily Emissions LBS./Day	Avg. Daily VMT [b)]	E.F. gm/mi. [1)]	Avg. Daily Emissions Lbs./Day
Summer (May-October	74,930	70.25	11,594	87,713	44.86	8,667
Winter (November-April)	62,845	80.81	11,186	73,566	52.17	8,454
Annual Average	69,060	74.91	11,395	80,842	47.98	8,544

a) As calculated using Mobile 1, Scenarios 7-12.

b) Projected from 1977 VMT assuming 3.2 percent (1.1706) average annual growth rate [from Smith, J. T., "Analysis of Santa Fe County Air Quality Maintenance Area (Carbon Monoxide)"]. NMEIA, May 1977.

"Roll-back" calculations for this area were also carried out, using a design value for 1976 obtained from the EPA. This value, 12.3 ppm CO 8-hour average, was reported for January 16, 1976, for 5:00 P.M. to 1:00 A.M. This measurement was recorded at Site 3Q which is located at Santa Fe Auto Electric, Cerrillos and Hickox Street. The highest 8-hour average concentration recorded was 12.4 ppm during the evening of December 7, 1976, also at Site 3Y. The highest hourly average concentration reported for Santa Fe was 16.5 ppm, and the second highest hourly average reading was also 16 ppm CO, again at Site 3Y.

No violations of the 35 ppm NAAQS for CO were recorded. A reduction in current emission levels will, however, be required to attain compliance with the federal air quality standards during 1977 as a result of 8-hour average measurements.

Assurance that the air quality standards will not be violated in 1982 is required, so a comparison of carbon monoxide emission levels expected

for 1982 with those measured for 1976 becomes necessary. A 24 percent emission reduction is anticipated for Santa Fe which should result in a 1982 design value of 9.5 ppm. This assumes a background CO value of 1 ppm. It appears that the 8-hour NAAQS will still be exceeded in 1982.

Las Cruces

Mobile source carbon monoxide emission inventories for the summer and winter seasons, and for the annual average for 1977 and 1982 were developed, separately, for the three designated non-attainment areas of Las Cruces. Again, these calculations utilized the VMT data and emission factors previously described. The results of these calculations are presented in Table 5-4.

"Roll-back" calculations for these areas were also carried out, where needed, using design values for 1977 obtained from the EIA. These values were taken, primarily, from data collected at Site 6W which was operated continuously throughout 1977 at the Howard Johnson's Motor Lodge at the intersection of I-10 and University Avenue within designated area (a). Limited data for 1977 were also available from Site 6ZA for January-May 1977.

Data from Site 6W provide the design value for area (a). The second highest 8-hour average carbon monoxide concentration (design value) reported for this site was 9.75 ppm, which occurred on December 14-15 from 6:00 P.M. to 2:00 A.M. The highest 8-hour average value was 11.125 ppm CO on December 6-7, from 9:00 P.M. to 5:00 A.M., and the third highest 8-hour average was 9.125 ppm CO on November 11-12, from 5:00 P.M. to 1:00 A.M. The maximum 1-hour average CO concentration was 19.0 ppm between 11:00 P.M. and midnight on December 6, 1977, and the second highest, which occurred twice (November 2 and December 7) was 15.5 ppm.

These data indicate that the 8-hour average NAAQS, 9.0 ppm, for carbon monoxide was violated at least twice, though the 1-hour standard of 35 ppm was not. Some reduction from 1976 mobile source emissions would thus be required for area (a). Application of the proportional model, or "roll-back" approach indicates this reduction to be 8.75 percent, based on the following calculation:

$$\frac{A-C}{A-B} \times 100 = \text{percent reduction needed}$$

TABLE 5-4

CARBON MONOXIDE EMISSIONS FOR LAS CURCES NON-ATTAINMENT AREAS

Time Period	1977			1982		
	Avg. Daily VMT	E.F.[a] gm/mi.	Avg. Daily Emissions Lbs./day	Avg. Daily VMT[b]	E.F.[a] gm/mi.	Avg. Daily Emissions Lbs./day
Area (a) 1,000 ft. radius circle						
Summer (May-October)	11,666	60.52	1,555	13,521	40.44	1,204
Winter (November-April)	10,555	69.14	1,607	12,233	45.69	1,230
Annual Average	11,110	63.99	1,566	12,877	42.46	1,205
Area (b) Picacho Avenue						
Summer (May-October)	18,809	73.64	3,051	21,800	49.91	2,397
Winter (November-April)	17,017	85.95	3,222	19,723	58.05	2,522
Annual Average	17,913	78.61	3,102	20,761	53.04	2,425
Area (c) Solano Drive						
Summer (May-October)	44,189	63.83	6,213	51,215	41.25	4,653
Winter (November-April)	39,981	75.06	6,610	46,338	48.67	4,968
Annual Average	42,085	68.36	6,337	48,777	44.10	4,738

a) As calculated using Mobile 1, Scenarios 13-36.

b) Projected from 1977 VMT assuming 3.0 percent average (1.159) annual growth rate [from Smith, J. T. "Analysis of Dona Ana County Air Quality Maintenance Area (Carbon Monoxide)"]. NMEIA, March-April, 1978, page 3.

where A = existing air quality (design value)

B = background concentration assumed to be 1 ppm for CO*

C = National ambient air quality standard

$$\frac{9.75-9.00}{9.75-1.00} \times 100 = 8.75 \text{ percent reduction needed}$$

*Smith, James T., "Analysis of Dona Ana County Air Quality Maintenance Area (Carbon Monoxide)". NMEIA, March 1978 (revised April 1978)

The more important determination, however, is whether or not compliance with the standard will be attained in 1982, recognizing that the federal vehicle emissions control program will bring about substantial emissions reductions by that time. A comparison of carbon monoxide emissions projected for that area in 1982 with those estimated for 1977 will permit that determination to be made.

Area (a) emissions reduction is 23 percent which results in a 1982 design value of 7.74. A background value of 1 ppm was assumed.

The carbon monoxide data for Site 6W in Las Cruces are primarily applicable to non-attainment area (a). Though these data appear to define the maximum ambient concentration levels for Las Cruces, it is also appropriate to consider the levels reported for Site 6ZA which is closer to designated areas (b) and (c). The limited data available for this site shows a design value of 11.6 ppm CO for the 8-hour value. None of the values reported exceeded 1-hour average federal air quality standards. The emission reduction for area (b) is 22 percent and 25 percent for area (c). These reductions indicate expected 1982 design values of 9.3 ppm for area (b) and 9.0 ppm for area (c). A background concentration of 1 ppm was assumed for both areas. Thus it appears that areas (b) and (c) will still exceed the 8-hour NAAQS in 1982.

APPENDIX

1977 VEHICLE EMISSIONS FOR THE ALBUQUERQUE TRANSPORTATION STUDY AREA

T[illegible] 1

1977 VEHICLE EMISSIONS FOR THE ALBUQUERQUE TRANSPORTATION STUDY AREA

TYPE OF FACILITY	AVERAGE TEMP	AVERAGE PEAK HOUR SPEED		MILES	% of SYSTEM	VMT	POLLUTION (kg/day)			POLLUTION (tons/day)		
	OF	MPH	KPH				HC	CO	NOX	HC	CO	NOX
FREEWAYS		54.1	87.05	40.60	2.3							
Winter Average	30°					1294803	8,701	77,882	5,089	9.59	85.83	5.61
Summer Average	70					1418772	9,279	80,757	5,576	10.23	88.99	6.14
Annual Average	50					1377449	9,119	80,195	5,413	10.05	88.37	5.97
MAJOR ARTERIALS		14.2	22.85	138.26	7.8							
Winter Average	30					2269620	34,180	369,766	5,856	37.67	407.48	6.45
Summer Average	70					2409928	32,269	316,327	6,218	35.56	348.59	6.85
Annual Average	50					2339814	32,945	336,816	6,037	36.31	371.17	6.65
MINOR ARTERIALS		24.6	39.58	99.33	5.6							
Winter Average	30					1107927	11,932	123,545	3,235	13.15	136.15	3.56
Summer Average	70					1176457	11,365	106,446	3,435	12.52	117.30	3.79
Annual Average	50					1142192	11,559	112,974	3,335	12.74	124.50	3.68
COLLECTORS		22.4	36.04	125.60	7.1							
Winter Average	30					696841	10,216	121,278	2,063	11.26	133.65	2.27
Summer Average	70					739943	8,650	87,195	2,190	9.53	96.09	2.41
Annual Average	50					718392	9,282	100,848	2,126	10.23	111.13	2.34
FRONTAGE ROADS		24.6	39.58	15.98	0.9							
Winter Average	30					48354	.521	5,392	.141	.57	5.94	.16
Summer Average	70					50326	.486	4,553	.147	.54	5.02	.16
Annual Average	50					49340	.499	4,880	.144	.55	5.38	.16
LOCAL STREETS		19.9	32.02	1357.09	76.4							
Winter Average	30					1157187	18,249	218,963	3,321	20.11	241.30	3.66
Summer Average	70					1180563	14,804	151,242	3,388	16.31	166.67	3.73
Annual Averages	50					1168875	16,224	178,394	3,355	17.88	196.59	3.70
TOTALS												
						6574732	83,799	916,826	19,705	92.35	1010.34	21.71
						6975989	76,853	746,520	20,954	84.69	842.67	23.09
Annual Average						6796062	79,628	814,107	20,410	87.75	897.15	22.49